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| EXAMINER |
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MUMMERT, STEPHANIE KANE

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| ART UNIT | PAPER NUMBER |
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1637

DATE MAILED: 10/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/713,898

Applicant(s)

SCHWARTZ ET AL.

Examiner

Stephanie K. Mummert, Ph.D.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 31 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 1-20 and 28-33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 8/16/04; 5/22/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group II, claims 21-27 in the reply filed on July 31, 2006 is acknowledged. The traversal is on the ground(s) that the Examiner has not shown that the apparatus of Group I can be used with a materially different process. Applicant asserts that "the purpose of the apparatus of Group I if used in any of the alleged materially different processes is to achieve the fixing and straightening afforded by the methods of Group II" (p. 1 of remarks). This is not found persuasive because applicant is reading an intended use into the apparatus claims. If the apparatus as described and claimed can be used for a materially different method or process, as established in the previously mailed requirement, the two groups are independent and distinct.

The requirement is still deemed proper and is therefore made FINAL.

2. Claims 1-20 and 28-33 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on July 31, 2006.

Claims 21-27 are pending and will be examined.

Claim Objections

3. Claim 24 is objected to because of the following informalities: The claim recites 'polymeric molecule at attached'. The inclusion of the term 'at' between 'molecule' and 'attached' appears to be a typographical error. Appropriate correction is required.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claim 21 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 7,049,074, issued May 23, 2006 ('074 patent herein). Although the conflicting claims are not identical, they are not patentably distinct from each other.

6. Claim 1 of the '074 patent is directed to a method of elongating and fixing a nucleic acid molecule on a planar surface coated with a positively charged substance and the density of said positively charged substance is sufficient that nucleic acid molecule is fixed and elongated along its length on the planar surface. Claim 21 of the instant application is drawn to a method of

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straightening and fixing polymeric molecules comprising multiple steps, including placing the polymeric molecules in a carrier liquid, passing the molecules and liquid through a microchannel comprising a wall which is electrostatically attractive to the polymeric molecule, promoting laminar flow and causing the molecule to adhere in a straightened configuration to the wall.

7. While the claims are not identical, the methods comprise straightening polymeric molecules generically (or nucleic acids specifically in the '074 patent) through fixing the polymers through electrostatic attraction between the polymer and the surface. In the '074 patent, the surface is planar and comprises a positively charged substance, while the instant application comprises a microchannel with a wall surface. The claims of the instant application and the '074 patent address a similar scope and breadth of a method of fixing and straightening of polymers or nucleic acids such that the claims of the instant application are obvious over the claims of the '074 patent.

8. Claim 21, 23 and 24 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 10 of U.S. Patent No. 6,509,158, issued January 2003 ('158 patent herein). Although the conflicting claims are not identical, they are not patentably distinct from each other.

9. Claim 1 of the '158 patent is directed to a method of characterizing a nucleic acid molecule comprising imaging the nucleic acid molecule, which is elongated and fixed along its length on a solid planar surface so that said nucleic acid molecule is individually accessible to enzymatic reactions. Claim 21 of the instant application is drawn to a method of straightening and fixing polymeric molecules comprising multiple steps, including placing the polymeric

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molecules in a carrier liquid, passing the molecules and liquid through a microchannel comprising a wall which is electrostatically attractive to the polymeric molecule, promoting laminar flow and causing the molecule to adhere in a straightened configuration to the wall. Claims 23 and 24 of the instant application are directed to applying restricting enzymes to the straightened polymer and optical inspection of the polymer.

While the claims are not identical, the methods comprise straightening polymeric molecules generically (or nucleic acids specifically in the '158 patent) through fixing the polymers through electrostatic attraction between the polymer and the surface. In the '158 patent, the surface is planar while the instant application comprises a microchannel with a wall surface. The claims of both patents are also directed to optical or imaging analysis of the straightened polymers and include enzymatic analysis. The claims of the instant application and the '158 patent address a similar scope and breadth of a method of fixing and straightening of polymers or nucleic acids such that the claims of the instant application are obvious over the claims of the '158 patent.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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11. Claims 21-22; 24-25 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Bensimon et al. (US Patent 6,265,153; July 2001). Bensimon teaches a process for aligning a macromolecule onto the surface of a support comprising fixing one end onto the surface (Abstract).

With regard to claim 21, Bensimon teaches a method of straightening and fixing polymeric molecules comprising the steps of:

(a) putting the polymeric molecules in a carrier liquid (col. 1, lines 43-50, where the aligning is carried out through the interaction of a surface, S, a solvent A and a medium B),

(b) passing the polymeric molecules and carrier liquid through a micro-channel (Example 1, col. 17, lines 18-55, where the anchoring and fixing of the polymeric molecule is disclosed, including the solution comprising the molecule between two cover slips, which provides a channel for the movement of the DNA molecules; see also Figure 6, where the fixing and passage of the molecule is schematically depicted; legend, col. 2, lines 17-20) having a first wall electrostatically attractive to the polymeric molecule (col. 3, lines 58-65, where the adsorption of the macromolecule onto the surface can be controlled through surface charges and the electrostatic interactions between the surface and the molecule; col. 4, lines 52-61, where specific types of surface functionalities are described; see also col. 5, lines 4-23, for example) to promote a laminar flow of carrier liquid in the micro-channel causing the polymeric molecule to adhere in straightened configuration to the first wall (Example 1, col. 17, lines 39-46, where capillary force on the DNA molecule(s) is sufficient to stretch the molecule; col. 4, lines 4-6, where it is noted that one aligned, the molecules adhere strongly to the surface).

With regard to claim 22, Bensimon teaches an embodiment of claim 21 further including the step of (c) detaching the first wall from the micro-channel (Example 3, col. 19, lines 21-26, where the coverslip is removed from the adhered molecules).

With regard to claim 24, Bensimon teaches an embodiment of claim 21 further including the step of (c) optically inspecting the straightened polymeric molecule at attached to the first wall (col. 10, lines 54-60, where the stretched molecules can be revealed by a variety of techniques, including optical fluorescence microscopy).

With regard to claim 25, Bensimon teaches an embodiment of claim 21 further wherein step (b) first causes a straightening of the polymeric molecule in the laminar flow and second causes attachment of one end of the polymeric molecule to the first wall and third causes attachment of the length of the polymeric molecule to the wall (Example 1, col. 17, lines 18-55, where the anchoring and fixing of the polymeric molecule is disclosed, including the solution comprising the molecule between two cover slips, which provides a channel for the movement of the DNA molecules; see also Figure 6, where the fixing and passage of the molecule is schematically depicted; legend, col. 2, lines 17-20).

With regard to claim 27, Bensimon teaches an embodiment of claim 21 further including the step of treating at least one wall of the micro-channel to have a positive surface charge of predetermined density (col. 3, lines 58-65, where the adsorption of the macromolecule onto the surface can be controlled through surface charges and the electrostatic interactions between the surface and the molecule; col. 4, lines 52-61, where specific types of surface functionalities are described; see also col. 5, lines 4-23, for example).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bensimon et al. (US Patent 6,265,153; July 2001). Bensimon teaches a process for aligning a macromolecule onto the surface of a support comprising fixing one end onto the surface (Abstract).

With regard to claim 23, Bensimon teaches an embodiment of claim 21 further including the step of (c) applying restricting enzymes to the straightened polymeric molecule attached to the first wall (col. 12, lines 53-58, where physical mapping of genomic DNA can be carried out through a method comprising the steps of extraction, purification, cleavage with restriction enzyme followed by 'combing' on surfaces).

Regarding claim 23, Bensimon teaches that the method of physical mapping of polymeric molecules comprises through restriction digestion followed by fixation and elongation. However, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to modify the order of method steps taught by Nesme to arrive at the claimed invention with a reasonable expectation of success. As noted in the MPEP § 2144.04 IV C, "Ex parte Rubin , 128 USPQ 440 (Bd. App. 1959) (Prior art reference disclosing a process of making a laminated sheet wherein a base sheet is first coated with a metallic film and thereafter impregnated with a thermosetting material was held to render prima facie obvious claims directed to a process of making a laminated sheet by reversing the order of the prior art process

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steps.). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) (selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results); *In re Gibson*, 39 F.2d 975, 5 USPQ 230 (CCPA 1930) (Selection of any order of mixing ingredients is prima facie obvious.).” Therefore, in the absence of new or unexpected results, it would have been prima facie obvious to one of ordinary skill in the art to adjust the order of the method steps taught by Bensimon to arrive at the claimed invention with a reasonable expectation for success.

14. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bensimon as applied to claims 21-22, 24-25 and 27 above, and further in view of Kaiser et al. (*Journal of Molecular Biology*, 1963, vol. 6, p. 141-7). Bensimon teaches a process for aligning a macromolecule onto the surface of a support comprising fixing one end onto the surface (Abstract).

With regard to claim 26, Kaiser teaches an embodiment of claim 21 wherein the polymeric molecules are treated with a condensation agent to collapse the polymeric molecules into shear resistant balls and wherein step (a) includes the step of placing the polymeric molecules and carrier liquid into a reservoir attached to the micro-channel and decondensing the polymeric molecules in the reservoir prior to step (b) (Table 1, where specific concentrations of spermine are disclosed and p. 142, ‘materials and methods’ heading where DNA was isolated from bacteriophage λ and incorporated into the assay; p. 146, where it is noted that the protective effect may result from the formation of soluble aggregates).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have included the teachings of Kaiser, regarding the protection of nucleic acids through the inclusion of spermine to the method of DNA stretching and analysis taught by Bensimon to arrive at the claimed invention with a reasonable expectation for success. As taught by Kaiser, "Spermine markedly protects DNA from breakage by rapid stirring" (Abstract, line 1). Kaiser also teaches that "When λ DNA was stirred in the presence of spermine as shown in Table 1 neither the infectivity nor the ratio of turbid plaques to total plaques changed from their initial values." (p. 144, top paragraph). Finally, Kaiser concludes that "the data presented above show that polyamines, spermine in particular, protect λ DNA from breakage by rapid stirring" (p. 146, 'discussion' heading). The method taught by Bensimon "allows the detection and/or quantification of biological macromolecules, but also the measurement of intramolecular distance" (col. 9, lines 32-34) and is practiced "under conditions for forming a DNA/DNA, DNA/RNA hybrid or for forming the protein/protein reaction product" (col. 9, lines 44-46). Also, Bensimon notes that "advantageously, the attached DNA and the DNA of the sample are colored differently and after stretching, the position of the complementary sequence relative to the end of the sample DNA is measured" (col. 9, lines 55-58). Considering these teachings, Bensimon expresses motivation to maintain the polymer sequence, either DNA, RNA or polypeptide, in an intact linear format in order to facilitate the distance measurements noted previously. Therefore, Bensimon would have been motivated to incorporate solvents or steps directed specifically to the protection of the nucleic acid from breakage prior or during stretching. Therefore, considering the teachings of Kaiser towards the protective effects of spermine on DNA, one of ordinary skill in the art at the time the invention was made would have

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been motivated to incorporate spermine as taught by Kaiser into the method of DNA stretching and analysis taught by Bensimon to achieve intact molecules prior to and during stretching and analysis.

Conclusion

No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephanie K. Mummert, Ph.D. whose telephone number is 571-272-8503. The examiner can normally be reached on M-F, 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on 571-272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Stephanie K. Mummert

Stephanie K Mummert, Ph.D.

Examiner

Art Unit 1637

Kenneth R. Horlick
KENNETH R. HORLICK, PH.D.
PRIMARY EXAMINER

10/16/06